all collectors of marine plants. It is composed of branched filaments made up of large cylindrical cells placed end to end in a single row. When it is in fruit, the filaments are furnished with short branches terminated by a globular involucre, in the interior of which are ranged the reproductive bodies. How are these formed, and how do these filaments and appendages grow? What modifications do the cell-contents experience during this formation and growth? These are the points explained with a good deal of clearness by Dr. Wright in the first of the two latter memoirs referred to (on the cell-structure of *G. setacea*, and on the development of its antheridia and tetraspores). Referring to the memoir itself for details, I would only call attention to a peculiarity noticed in the development of the involucre. The rays which compose it take their origin in a circle from the penultimate cells of particular ramuli, formed by a small number of cells and slightly club-shaped at their superior extremity. These rays are not all at once free. Detached from the protoplasmic mass on which the apical cell reposes, they for a long time increase underneath the common membrane which clothes the frond, and they are only made free somewhat later on by the rupture of this membrane. First of all figured, but very imperfectly by Derbes and Solier, well represented from life by Thuret, this peculiar disposition is shown by Dr. Wright as made clear by the use of reagents, and it would appear to be equally met with in the genus Pandorea, recently described by J. Agardh.

In following from their first appearance the development of the reproductive organs on the rays of the involucre, Dr. Wright observed that the cells destined by their origin and their position to form the tetraspores, did not all comport themselves in the same manner. Some of them produced the ordinary four spores, but in the interior of the others globular cells arose provided with a beak, from which there came out colourless corpuscles, wonderfully like the antherozoids of the Florideæ. The resemblance of these bodies to species of Olpidium did not escape Dr. Wright, but struck by their constant presence on the specimens which he examined, by the regularity with which they appeared on determined points of the involucre, he thought they might be regarded as the antheridia of *Griffithsia setacea*, and here he has overlooked the fact that true antheridia, of the ordinary type in the Florideæ, had long since been described and figured in this very species by Thuret (*Ann. des Sc. Nat.* 3 ser. Bot. Tom. 16). On this occasion Dr. Wright, however, records an observation as new as interesting, viz., that he has seen the corpuscles as they left these wrongly imagined antheridia perform movements after the manner of amœbæ.

In the second of the two memoirs, having for its title "On the Formation of the so-called 'Siphons,' and on the Development of the Tetraspores in Polysiphonia," the author describes with much care the method of the formation of the frond in *Polysiphonia urceolata*, and very exactly proves the relationship existing between the "tube central" and the "siphons," and between the siphons themselves. For a great part he therein only confirms the results of those preceding him in such investigations, for the history of the development of the frond in Polysiphonia has been almost exhausted by the works of Naegeli, Kny, and Magnus. I am almost afraid that an analysis of these minute details would inspire the reader with that horror which, according to Naegeli, such morphological researches bring with them to the systematic botanists, but I cannot bring myself to omit extracting the following passage, in which some curious vital phenomena are incidentally described by Dr. Wright, as he found them to exist in the cells of Bryopsis.

"Under the influence of some local irritation, which must not be enough to injure the cell wall of the specimen under examination, the denser portion of the protoplasm will often be found to draw itself from the upper part of these cells. As it does so, the very conspicuous chlorophyll granules will be seen to be drawn together until they become pretty tightly packed. There is an apparent rounding off of the upper portion as it gets drawn down in the tube of the cell wall, and under a low power of the microscope this convex surface seems pretty sharply defined; but turn on a high quarter of an inch or an eighth of an inch objective, and a very remarkable phenomenon will present itself—for there will then be seen a mass of pseudopods not easily to be forgotten and difficult to describe under any other name; they stream away from below the apex of the cell wall, converging downwards until they are lost in the centre of the convex margin of the withdrawing mass of protoplasm. Here they are broad, while towards the apex of the cell they disappear through their very tenuity. Coursing down along these pseudopods, very minute granules can be, on careful focussing, detected; these are ultimately lost in the denser protoplasmic mass which engulphs them. This streaming goes on for a while, until all the protoplasm of a certain density is drawn into the lower mass; this then finally rounds itself off and forms an independent cell wall in front, which of course will be below the former growing point of the cell. There is apparently no plastic protoplasm remaining above this—no small disc even of homogeneous mucilage to be seen; all the viscid protoplasm seems to have gone to the rear, and it would appear as if the upper portion should now become sphacelated—perhaps disappear—and a new apical growth proceed from below it; but this is not so; there is life in the front still; it goes on growing as before, and in process of time it will be found to leave in its rear dense chlorophyll-bearing protoplasm, and so on through the several layers until the *punctum* itself is, as before, reached."

OUR ASTRONOMICAL COLUMN

BIELA'S COMET.—As bearing upon the possible return of Biela's comet during the latter part of the present year, it will not be out of place if we here summarise the results of an investigation made by Prof. Oppolzer in 1873, on the possible connection of the comet discovered by Mr. Pogson at Madras on December 2 previous, with Biela's comet and the great meteoric shower of November 27, 1872. It will be remembered that the comet in question was found in consequence of a telegram sent by Prof. Klinkerfues to Madras immediately after the meteoric display, to the effect that Biela's comet had "touched the earth" on the evening of November 27, and urging Mr. Pogson to search for it near the star θ Centauri. From the Madras observations on the nights of December 2 and 3 (the only occasions on which the weather was favourable), as they were first approximately reduced, Oppolzer derived the following data:—

1872, December 3·0 M.T. at Berlin.

Comet's geocentric longitude (λ)	223°	15′·6
,, ,, latitude (β)	− 20	10·0

And the unit of time being a mean solar day,

$$\frac{d\lambda}{dt} = +187'{\cdot}0, \quad \frac{d\beta}{dt} = +46'{\cdot}3.$$

At a subsequent time Mr. Pogson published more accurate positions of the comet than those at first communicated, which would give the following similar data, differing, it will be seen, in no material degree from those adopted by Oppolzer:—

1873, December 3·0 M.T. at Greenwich.

λ ... 223° 21′·1 β ... −20° 8′·6 $\frac{d\lambda}{dt}$ ... +189′·9 $\frac{d\beta}{dt}$ ... +46′·4

It had soon been found, as might have been expected, that no satisfactory conclusion could be arrived at by comparison of Michez's elements of Biela's comet with

the observations, proportionally small variations in the elements producing greatly magnified effects upon the geocentric place and geocentric motion, in consequence of the close proximity of the comet.

Oppolzer describes his method of calculation in No. 1,938 of the *Astronomische Nachrichten*, to which we must refer the reader, as an outline of it would unnecessarily extend this note. He makes three assumptions as to the distance of the comet from the earth and deduces three orbits for comparison with the orbit of Biela's comet, as follow :—

	(A)	(B)	(C)	Orbit of Biela.
Distance assumed ...	0·04	0·08	0·12	—
	° ′	° ′	° ′	° ′
Mean anomaly	− 4 54·4	− 5 6·8	− 5 4·8	—
Long. of perihelion ...	128 48	141 9	151 50	109 45
,, ascending node	247 38	244 34	242 12	245 50
Inclination	9 14	10 28	11 46	12 22
Angle of excentricity..	51 36	54 17	56 49	48 48

It must be added that Oppolzer pre-supposes the comet moving in an orbit with same semi-axis major as that of Biela, the corresponding mean daily motion being 530″·1; hence with the above mean anomalies on December 3·0, the dates of perihelion passage on the three hypotheses would be respectively January 5·3, January 6·7, and January 6·5.

The similarity of these systems of elements is striking; only in the longitude of perihelion are there comparatively large differences, which Oppolzer observes, may not appear so noteworthy when it is remembered that Michez's elements do not include the effect of perturbations from 1866 to 1872, nor those which might just have resulted from the presumed exceedingly close approach of the comet to the earth on the night of the meteoric shower. The great difference of nearly three months in the perihelion passage, however, he regarded as against the identity of the object with Biela's comet, though from the anomalies which the disintegration of the comet might have occasioned, this circumstance might not really possess all its apparent signification. His general conclusions may be stated thus :—It may be asserted with confidence that assuming the distance of Pogson's comet from the earth December 3·0 to have been within the limits 0·04 and 0·12 of the earth's mean distance from the sun, we are led to elements which show a remarkable resemblance to those of Biela's comet, as well as with the course of the great shower of meteors on November 27, 1872. When the distance is much increased we find materially different elements, and the greater distance cannot be regarded as improbable; in this, Oppolzer remarks, lies in his opinion the weakest point of the argument, and only by observations at a future time can a certain conclusion be attained. Nevertheless he considers the striking coincidences following on arbitrary assumptions, taken together, militate strongly in favour of the approximate correctness of his assigned distance. Thus there seems to be under the above suppositions as to the comet's distance, a most remarkable connection with the meteor-shower of November 27. If, as a rough approximation, it is assumed that the comet at 8 P.M. on that day touched the earth, and further, that the differential daily variation of the distance within the $5\frac{2}{3}$ days was equable, an hypothesis, which in the case of a contact, will not differ much from the truth, there will be deduced from the three values, for the distance of the comet on December 3, respectively 0·061, 0·071, and 0·080; comparing these values with those assumed, it is seen at once that an agreement is established with the final value, when the distance = 0·07 nearly. This result Oppolzer urges as highly deserving of note, and in his opinion almost demonstrates the connection of the swarm of meteors with the comet. On the supposition that the true values of the elements must be sought between the systems (A) and (B), considering further that the earth on November 7·3 was in 65°·9, heliocentric longitude, and that the comet if it gave occasion to the meteor-shower must have been situate near its descending node, so the longitude of the node by this criterion would be 245°·9, a value which also falls between the limits (A) and (B).

Further, if the distance of the comet from the earth is calculated from the above elements for the time of the meteor-shower, the following series is formed :—

A	B	C
0·024	0·009	0·053

and it is seen that the assumption of 0·07 for the distance on December 3, leads to a very close approximation of the comet to the earth at the time of the shower. Calculating now the comet's radius-vector for November 27·3, the three systems give logarithmically—

A	B	C
0·0042	9·9950	9·9908

while the log. distance of the earth is 9·9940. Consequently with elements A and B the comet is a little outside the earth's orbit, and with elements C it would occupy a position within it. At the first glance it will appear probable that necessarily the last relation must have place, or the comet would certainly have been detected ere it reached its least distance from our globe. On the one side, from the uncertainty of the data for calculation, the results may be considerably in error, on the other there may be some probability that the comet was visible in the southern hemisphere, and we might have received intimation that a comet of great brightness and with rapid motion was there recognised. Calculating from the three systems of elements the geocentric place, there result—

	A	B	C
λ	67°	110°	180°
β	+11	− 75	− 25

so that, in fact, with the system B, which appears to approach nearest the truth, the circumstances of visibility for the southern hemisphere would be favourable.

Weighing all these circumstances, Oppolzer thought it must be granted that Pogson's comet stands with high probability in intimate relation with the meteor-shower of November 27, and that it is possible the observed object was one of the heads of Biela. That the second head was not found, is not decisive against this, since the same, on account of close proximity to the earth, might have been situate in an entirely different quarter of the heavens, and besides, from its greater relative distance, might have been considerably fainter, so as easily to escape detection. Thus, at the time of writing his paper on the subject, Oppolzer was of opinion that the connection of Biela's comet with Pogson's object and the meteor-shower was by no means to be regarded as improbable.

GEOGRAPHICAL NOTES

THE *Golos* publishes a telegram, dated the 13th of May, from the celebrated Central Asian traveller, M. Prjevalsky, formerly a colonel in the Russian army. At that time he was on the river Buluguna. He had marched 600 versts from Saisan along the river Urumtsu, and would immediately set out for Chemi through the southern Altai mountains. All the members of his expedition were in good health.

THE Alexandria correspondent of the *Daily News* sends some details of Major Serpa Pinto's recent journey across Africa from Benguela to Durban. He tells us little that has not been already made known, and we shall look with eagerness for Pinto's promised work. Science has evidently had considerable attention rom Major Pinto during his journey. He has brought home a collection of 1,800 plants and "a superb collection of birds and insects." Astronomical and meteorological observations have been taken along the route, and several volumes of notes made, with maps. The Coando, which flows into the Zambesi,